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ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP
1725 K STREET, NW
SUITE 1000
WASHINGTON, DC 20006

EXAMINER

JOLLEY, KIRSTEN

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1762

DATE MAILED: 12/29/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/926,671

Applicant(s)

MURAKAMI ET AL.

Examiner

Kirsten C Jolley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected. ~
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6. 6) ☐ Other:

DETAILED ACTION

Examiner's Suggestions

1. In claim 14, the Examiner suggests that acronyms "TEOS" and "TMOS" are spelled out in their first occurrence in the claims.

Claim Rejections - 35 USC § 103

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2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kennedy et al. (US 6,506,497).

With respect to claims 1 and 8, Kennedy et al. discloses a method for preparing a spin-on-glass (SOG) film having an absorbing compound therein. Kennedy et al. teaches that the method for preparing the SOG comprises preparing a reaction mixture including silane reactants, one or more absorbing compounds, a solvent such as 2-propanol or other simple alcohols, and an acid/water mixture (col. 6, lines 22-37). Kennedy et al. teaches at col. 6, lines 54-57, that optionally surfactants are also added to the coating solution. Then, at col. 7, lines 25-36, Kennedy et al. teaches that the absorbing SOG coating solutions are applied to various layers used in semiconductor processing by spin-on deposition techniques. Kennedy et al. teaches a thickness spin of between 1000 and 4000 rpm, and two or three bake steps at temperatures

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between 80 C and 300 C for about one minute each. While the Examiner acknowledges that Kennedy et al. does not specifically state that a porous SOG film is formed after its heat treatment steps, it is the Examiner's position that a porous SOG film would inherently result from Kennedy et al.'s process since the materials and process steps of Kennedy et al. are materially similar to those claimed by Applicant. Any differences in properties between the claimed invention and that of Kennedy et al. must have been caused by process variables not claimed in the instant application. Additionally, it is noted that an acid hydrolysis reaction occurs in the process of Kennedy et al., and that the solvent and water and surfactant necessarily evaporate during the heat treatment of Kennedy et al. because solvent, water, and surfactant are not left in the resulting SOG film.

As to claim 2, Kennedy et al. lacks a teaching of forming an additional SOG film on a first SOG film. It is the Examiner's position that it would have been obvious for one having ordinary skill in the art to have formed a second SOG film layer on top of the first SOG film layer in place of forming one thicker SOG coating film because splitting one step into two is an obvious and unpatentable variation.

As to claims 4 and 10, it is noted that the embodiment described in column 7 of Kennedy et al. is an exemplary embodiment of a semiconductor processing method. Kennedy et al. states at col. 7, lines 25-27, that "The absorbing SOG coating solutions are applied to various layers used in semiconductor processing, depending on the specific fabrication process..." The Background section of Kennedy et al. teaches in col. 1, lines 53-63, that silicon oxynitride is another material that has been used as an anti-reflective coating, and that the silicon oxynitride layer is typically deposited by chemical vapor deposition (CVD). It is the Examiner's position

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that it would have been obvious to have used two anti-reflective coatings in combination, such as silicon oxynitride and the light-absorbing SOG film of the invention, with an expected result of improved anti-reflectance qualities over the use of one layer alone. As to claims 3 and 9, it is the Examiner's position that it would have further been obvious to have used a plurality of the anti-reflective coatings taught by Kennedy et al. (both silicon oxynitride and the absorbing SOG of the invention) with the expectation of even further improved anti-reflectance qualities.

As to claims 5 and 11, Kennedy et al. teaches exposing the SOG film to UV light irradiation in col. 7, lines 60-63. It is the Examiner's position that this irradiation step would inherently remove unreacted OH groups remaining in the SOG film because the materials and process steps of Kennedy et al.'s process are materially similar to those claimed by Applicant. Any differences in properties between the claimed invention and that of Kennedy et al. must have been caused by process variables not claimed in the instant application.

As to claim 6, Kennedy et al. teaches that the exemplary heat treatment described in col. 7, lines 32-34, comprises two or three bake steps at temperatures between 80 C and 300 C for about one minute each. It is the Examiner's position that heat treatment at a first lower temperature would perform evaporation and the second heat treatment at a second higher temperature would cover the inner walls of holes with hydrophobic moieties of surfactant because the materials and process steps are similar to those claimed by Applicant.

As to claims 7 and 12, Kennedy et al. teaches a high temperature of 300 C, which is lower than the claimed temperatures of 350 to 450 C, nor does Kennedy teach specific intermediate temperatures used. However, it is noted that the temperatures taught by Kennedy et al. are merely exemplary and not limiting. Additionally, it is well known in the coating art that heat

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treatment temperatures are cause-effective depending upon the length of time of heating, the specific materials used, the desired characteristics of the product, etc. It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

As to claims 13 and 14, Kennedy et al. teaches that the organic silane may be TEOS or TMOS (col. 6, lines 23-24). As to the surfactant used, it is noted that Kennedy et al. lists exemplary surfactants FC430 by 3M and Megaface 408 by DIC (col. 6, lines 54-57). However, it is noted that Kennedy et al. states that "surfactants" in general are added to the coating solution, and the above-mentioned surfactants are merely exemplary. Accordingly, it is the Examiner's position that it would have been obvious for one having ordinary skill in the art to have used any surfactant in the coating solution of Kennedy et al., including those claimed by Applicant, with the expectation of successful results since Kennedy et al. is specifically not limiting as to the surfactants that must be used.

As to claim 15, Kennedy et al. is silent regarding the respective amounts of water, acid, and surfactant that are used in its coating composition. It would have been obvious for one having ordinary skill in the art to have determined the optimum amounts of water, acid, and surfactant in order to successfully form a SOG solution having the desired qualities through routine experimentation, in the absence of a showing of criticality.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Kennedy et al. (US 6,268,457) and Baldwin et al. (US 6,368,400) are cited for their teachings of a SOG coating solution comprising a surfactant, similar to the Kennedy et al. reference discussed above in the rejections.


Leung et al. (US 6,204,202) is cited for its teaching of a coating composition used to form a porous dielectric film whereby the composition comprises a thermally degradable polymer to form the pores therein.

Sakamoto et al. (US 5,762,697) and Matsuda et al. (US 6,586,104) are cited to illustrate the state-of-the-art with respect to preparing SOG coating films, however the references do not teach the use of a surfactant.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kirsten C Jolley whose telephone number is 571-272-1421. The examiner can normally be reached on Monday to Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P Beck can be reached on 571-272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193.


Kirsten C Jolley
Patent Examiner
Art Unit 1762

kcj